electron theory of electric action rests; its experimental verification is vital to the theory, and, indeed, to the whole of the recent views, of the origin of electric and magnetic forces.

A method of testing the existence of the effect is given by Maxwell in his "Electricity and Magnetism," and was first put into practice, with some modifications, by Rowland in 1876. The experiment, carried out in Helmholtz's laboratory, proved to the satisfaction of Helmholtz and of Maxwell that the effect existed; this consisted in rotating a charged disc of gilded ebonite near an astatic magnetic needle and observing the deflection. This was very small, from 5 to 7·5 mm., but it agreed with the amount expected from the theory. In 1883 Lecher attempted to repeat these experiments, but with negative results; Röntgen, however, in a research having another object, obtained the same effect from a moving charge as Rowland had done. In 1889 Rowland and Hutchinson took the matter up, and, modifying the apparatus, obtained results which appeared to establish the convection of an electric charge on a moving conductor without a doubt.

In 1897 Crémieu began his experiments. If a charged moving conductor produces a magnetic field, a charged conductor at rest in a varying magnetic field should be subject to mechanical force. Crémieu failed to detect this force in an experiment arranged for its measurement, though, according to calculation, it ought, if existing, to have been easily measurable. He then attempted Rowland's reverse experiment, the detection of the magnetic field, but modified entirely and in an ingenious manner Rowland's arrangement. Imagine a coil placed in close proximity to the rotating disc, the planes of the two being parallel, and let the ends of the coil be connected to a galvanometer. On charging the disc a magnetic field is produced near the coil, if the Faraday-Maxwell views be true; thus a current is induced in the coil, and a throw of the needle of the galvanometer is the result. Then by arranging to charge and discharge the disc alternately, and by means of a commutator to reverse the galvanometer connections suitably, the throw becomes a permanent deflection the amount of which can be calculated. These experiments Crémieu carried out with consummate care, and the result was negative. The needle remained at rest; there was no such thing as electrical convection. This fact he verified apparently by several ingenious modifications of his apparatus and his method, always with the same result; and when at the Glasgow meeting of the British Association he gave an account of his work, probably no one in the room except himself accepted his results, but no one, and the critics were both acute and numerous, could find the flaw.

Meanwhile, Rowland had returned to the defence of his position; it was almost the last piece of work he undertook, and just at the time of Crémieu's visit to Glasgow, September, 1901, there appeared a full account of experiments in the Johns Hopkins Laboratory by Pender, who, adopting Crémieu's induction method, again verified Rowland's result. From the observations a value can be found for the velocity of light, and Pender found it to be $3{\cdot}05 \times 10^{10}$ cm. per second, a value sufficiently near to the truth to establish beyond a doubt the theory of the measurements. This was verified by further work published early this year; meanwhile, Crémieu continued to obtain his negative results.

Such was the position when Pender was invited to Paris to repeat, in the splendid laboratories of the Sorbonne, and in conjunction with Crémieu, the experiments he had made in Baltimore. Funds were provided, in part by the Carnegie Institution, in part by the Institute of France, and the two experimenters set to work together, and with the same result—Pender verified the Faraday-Maxwell theory, Crémieu disproved it.

Experiments were then made on the direct magnetic effect, repeating, but with some modifications to meet objections of Crémieu, Rowland's original experiment. These, again, led to the result that a charged surface moving in its own plane produces a magnetic field; the very sensitive and permanent astatic system employed in this experiment will be found useful elsewhere, but reference must be made to the original paper for an account of it. Finally, Crémieu was convinced; it remained only to account for his negative results.

It was observed that in all cases he had covered the charged conducting surfaces with a thin layer of some dielectric other than air, usually india-rubber or mica, and there seemed some reason to suppose his failure was due to this, and so it was proved to be; the removal of the dielectric coating from Crémieu's apparatus enabled him to observe the convection effect, while by coating the discs used in Pender's induction experiment with mica, the convection effect was reduced by some 90 per cent.

How the dielectric acts is still a mystery; it is satisfactory, however, that the two experimenters are in agreement. The thanks of physicists are due to those who suggested and rendered possible this somewhat novel collaboration; it is satisfactory to the great French physicists who have aided Crémieu with advice and assistance that the matter should be settled at Paris; it is satisfactory to Pender that he has established conclusively and finally the result which was the beginning of Rowland's brilliant fame.

At the same time, the question, What does the dielectric do? remains an interesting one, especially as Vasilesco-Karpen, in a paper which follows the one we have been discussing, finds that it has no effect on the result. He modified Crémieu's arrangement by introducing a condenser into his circuit of coil, commutator and galvanometer, in which induced currents are set up by the alternating charge and discharge of the rotating discs. By suitably arranging the period of this circuit he was able to intensify the efforts considerably, and obtained a reasonably satisfactory agreement between his results and theory. The disc, as was the case in most of Pender and Crémieu's experiments, moved between condensing plates, and Vasilesco-Karpen made the following four series of experiments:—(1) Disc bare, condensing plates bare; (2) disc bare, condensing plates covered with glass 4 mm. in thickness; (3) disc covered with a thin layer of caoutchouc, condensing plates bare; (4) disc as in (3), condensing plates as in (2)

He states as the result that, so long as the speed and the charging voltage are kept constant, the magnetic effect is the same in all these cases. This result is opposed to that of Crémieu and Pender, who found that coating the disc with a thin layer of rubber destroyed the convection effect, and so the matter rests at present. The magnetic effect due to the motion of an electron is confirmed; some of its secondary consequences remain obscure.

NOTES.

The list of birthday honours includes the following names of men known in the scientific world:—Prof. C. Le Neve Foster, F.R.S., has received the honour of knighthood. Colonel D. A. Johnston, director-general of the Ordnance Survey, has been appointed a Companion of the Order of the Bath. Dr. Robert Bell, F.R.S., acting director of the Geological Survey of Canada, has been appointed a Companion of the Imperial Service Order. The

Hon. A. C. Gregory, formerly surveyor-general of Queensland, who has done much for exploration and the promotion of science in Australia, has been promoted to the rank of K.C.M.G.

THE following is a list of those to whom the Royal Society has this year awarded medals. The awards of the Royal medals have received His Majesty the King's approval:—The Copley medal to Prof. Eduard Suess for his eminent geological services, and especially for the original researches and conclusions published in his great work "Das Antlitz der Erde"; a Royal medal to Mr. Horace T. Brown for his work on the chemistry of the carbohydrates, and on the assimilation of carbonic acid by green plants; a Royal medal to Sir David Gill for his researches in solar and stellar parallax, and his energetic direction of the Royal Observatory at the Cape of Good Hope; the Davy medal to M. Pierre Curie and Madame Curie for their researches on radium; the Hughes medal to Prof. J. Wilhelm Hittorf for his experimental researches on the electric discharge in liquids and gases.

WE are informed that Dr. Charles J. Martin, F.R.S. has now entered upon his duties as director of the Lister Institute of Preventive Medicine, and in future the administrative work of the Institute will be under his control.

THE annual course of Christmas lectures at the Royal Institution, specially adapted to young people, will be delivered by Prof. Ray Lankester, F.R.S., whose subject is "Extinct Animals." The first lecture will be given on Tuesday, December 29.

AN application has been made by the German Meteorological Office for daily telegraphic reports from the Ben Nevis Observatory, with the view of applying them in forecasting the weather of north-western Europe. The directors of the observatory have agreed to send the telegrams asked for.

MANY biologists will regret to know that Mr. I. C. Thompson, well known as a naturalist, and especially for his work in connection with the Liverpool Marine Biology Committee, died suddenly on November 6.

PROF. RAPHAEL PUMPELLY, of Newport, R.I., and Prof. W. M. Davis, of Harvard, have returned from a journey in Turkestan, made under the auspices of the Carnegie Institution, to study the ancient human occupation of the region in relation to its physiography. *Science* states that the expedition proceeded from Baku to the end of the main line of the Central Asiatic Railway at Tashkent. Prof. Pumpelly, with one party, then made an excursion south-eastward across the Alai range and valley to Lake Karakul on the northern Pamir. Prof. Davis and his party went north-east, crossing the western Tian Shan ranges to Lake Issikul.

IT is reported in some of the daily papers that Dr. Otto Schmidt, of Cologne, has succeeded in isolating and cultivating a parasite from cancer, and in preparing an antiserum for the disease. So many positive statements of the isolation of a cancer-parasite have been made during the last few years, and have subsequently proved to be incorrect, and so many capable men have been investigating cancer without result, that reports of this kind cannot be accepted without further proof. The publicity given to matters of this kind is much to be deprecated; in the majority of instances false hopes are raised which must end in disappointment for many sufferers.

LIEUT.-COLONEL BRUCE, who has been investigating sleeping sickness in Uganda, has returned to England, having confirmed and extended the observations of Castellani upon the presence of a trypanosome parasite in this disease. The trypanosome was found to be present in practically every case in the cerebro-spinal fluid, and also in the blood. From analogy with nagana or tsetse fly disease of horses and cattle, it was surmised that a species of tsetse fly might carry the infection in sleeping sickness, and along the shores of the Lake Victoria Nyanza, where the disease is especially rife, large numbers of a tsetse fly (*Glossina palpalis*) were found, and were demonstrated by experiment to be capable of carrying the trypanosome. Moreover, freshly caught flies in infected areas were in some instances found to harbour trypanosomes. It is further suggestive that this fly is confined to certain well-defined areas which correspond absolutely with the distribution of sleeping sickness; in regions where no *Glossina palpalis* is found there is no sleeping sickness. These investigations therefore point to the conclusion that sleeping sickness is a human tsetse fly disease.

AT the Royal Geographical Society on Tuesday Commander Peary gave an address on his "Four Years' Arctic Exploration, 1898–1902." In the year 1899 he obtained the material for an authentic map of the Buchanan Bay, Bache Peninsula, Princess Marie Bay region, crossed the Ellesmere Land ice-cap to the west side of that land, established a continuous line of caches from Cape Sabine to Fort Conger, and familiarised himself and party with the entire region as far north as Cape Beechey. During the journey in 1900 Commander Peary determined conclusively the northern limit of the Greenland archipelago, or land group, and practically connected the coast south-eastward to Independence Bay, leaving only that comparatively short portion of the periphery of Greenland lying between Independence Bay and Cape Bismarck indeterminate. The non-existence of land for a very considerable distance to the northward and north-eastward was also settled, with every indication pointing to the belief that the coast along which the party travelled formed the shore of an uninterrupted central polar sea extending to the Pole, and beyond to the Spitsbergen and Franz Josef Land groups of the opposite hemisphere. In 1901 Commander Peary left Conger for another northern trip, but on reaching Lincoln Bay it was evident that the condition of men and dogs negatived the possibility of reaching the Pole, so the party returned to the *Windward* at Payer Harbour. In 1902 a start was made from Payer Harbour for the northern journey, and latitude 84° 17′ 27″ N. was reached, but the party had to return, and in the autumn of the year the *Windward* steamed southward, arriving at Sydney, C.B., on September 17, 1902, after an absence of four years, three months, and ten days. Referring to his future plans, Commander Peary said he hoped to start north next July, and if the season was favourable he would have his ship by September 1 on the northern shore of Grant Land, near the *Alert's* winter quarters. Wintering there, he would start with the first of returning daylight in the following February to make a journey across the polar pack to the Pole and back again.

MAJOR RONALD ROSS read a paper on malaria in India and the colonies at the Royal Colonial Institute on Tuesday. In the course of his address he pointed out that scientific research has established three great laws concerning malaria:—first, that it is caused by numbers of microscopical parasites which live and propagate themselves in the blood; secondly, that these parasites are carried from sick persons to healthy ones by the agency of a genus of mosquitoes called Anopheles; thirdly, that these kinds of mosquitoes breed principally in shallow and stagnant terrestrial waters. Four years have elapsed since these facts were established, and a vast mass of information has been accumulated regarding the actual working of the preventive measures which have been based upon them. Major Ross described the State measures for the repression of malaria that have already led to successful results in Sierra Leone, Havana, Lagos, Ismailia, the German colonies, Hong Kong, and other places. It has been proposed that permanent sanitary commissioners should be appointed for some of the colonies, but Major Ross said that Mr. Chamberlain has suggested to him an alternative scheme, namely, that several learned societies should periodically be asked to send out special commissioners for the purpose of examining and reporting upon the sanitary affairs of specified tropical Crown colonies, and that such reports, after editing by the societies referred to, might then be submitted to Government for consideration. Commissioners of this kind would cost less, and, not being servants of Government, would be able to give entirely unprejudiced opinions.

A DEMONSTRATION was given last week at the works of Messrs. Johnson and Phillips of a new electrical process for the preparation of peat-fuel. The process aims at extracting the large percentage of water in peat, partly by mechanical and partly by electrical means; the freshly cut peat is packed into rotating cylinders, and whilst fans beat out part of the moisture, a strong current of electricity is passed through the mass which heats it and thereby helps the extraction of the water. It is claimed that a first-class fuel can be produced in this way, but no particulars as to the cost of production, or results of tests of the fuel by competent engineers, are given in the pamphlet describing the invention.

THE Nagri Sabha established in Benares has, we learn from the *Pioneer Mail*, interested itself in making additions to the Hindi literature, but the difficulty of translating English scientific works, on account of the absence of suitable Hindi equivalents for the English technical terms, has been an obstacle in the way of authors. The Sabha, therefore, resolved to remove this difficulty by compiling, with expert aid an authoritative dictionary of scientific words and phrases met with in the English scientific works, and separate glossaries were ready last year and circulated for criticism among men of science in India. In order finally to approve and pass the tentative lists, the Sabha appointed a committee from among its members, and invited the various local Indian Governments to nominate representatives. Criticisms have been received from men of science in various parts of India.

THE medical officer of health for the City of London states in his last report that a case of enteric fever has been notified from Paddington as having in all probability been caused by mussels sold in Billingsgate Market. The mussels were found to have been obtained from a dealer at Leigh-on-Sea, and in consequence samples of mussels and cockles from the same source were submitted to Dr. Klein for bacteriological examination. Dr. Klein reported that both the cockles and the mussels were polluted with sewage, some of them to a dangerous extent, and that the cooking of the molluscs had been very imperfectly carried out. This state of affairs having been brought to the notice of the Fishmongers' Company, the sale of cockles from Leigh has been prohibited in the London markets. Some months ago the Leigh cockles were found to be polluted, and warnings were issued and directions given for a minimum period of boiling to be adopted, which seem to have been disregarded.

A VERY interesting lecture, entitled "Allerlei Methoden, das Wetter zu prophezeien," delivered by Prof. J. M. Pernter, director of the Austrian Weather Service, before the Society for the Diffusion of Scientific Knowledge, Vienna, has recently been published by that Society. As the title suggests, the author deals with all kinds of methods employed for weather prediction from the earliest to the present time. After doing full justice to the usefulness of local weather signs, such as the appearance and movements of clouds, the formation of caps on hills, the colour of morning and evening skies and the like, often successfully interpreted by agriculturists and others, he gives particular attention to *a priori* theories based on cycles, the phases of the moon, and the motions of planets, and points out their general untrustworthiness, and the great difference between such theories and the empirical inductive methods adopted by the meteorological central offices. By these latter means only can any advance be made. With the knowledge which at present exists, however, he holds out little hope of being able to forecast the weather for more than one day in advance. To improve upon the results now obtained, the author points out that a more minute investigation is required (1) of each point of every form of distribution of barometric pressure; (2) of the rate and direction of travel of each depression over Europe; (3) of the manner in which a certain type merges into another form; and (4) of the change in the weather caused by the various modifications of each form of barometric distribution. By a careful study of such details the author thinks that the percentage of total successes of the forecasts may be gradually raised.

IN the *Proceedings* of the American Academy of Arts and Sciences, Prof. R. W. Wood discusses the anomalous dispersion, absorption, and surface colour of nitroso-dimethylaniline. This substance is interesting as filling the gap that exists between the aniline dyes and ordinary transparent substances.

M. CH. FÉRY describes in the *Journal de Physique* a convenient method for determining the constants of lenses. It depends on the principle that if a ray falls on a lens in a direction parallel to the axis, and at a distance d from it, it will undergo an angular displacement α, the tangent of which is d/f, where f is the focal length, and by observing α, f can be found. Moreover, by calculating the values of f corresponding to different values of d, the aberration can be calculated.

MANY attempts have been made to give purely dynamical proofs both of Maxwell's law and of the second law of thermodynamics, but nearly every one of these deductions has, on closer examination, been found to involve some assumption or other, and not to be a result of mathematical reasoning alone. In two recent communications to the *Philosophical Magazine* (August and October) Mr. S. H. Burbury discusses the late Prof. Willard Gibbs's treatise on statistical mechanics and Mr. J. H. Jeans's theory of gases, and his criticisms go to show that these investigations form no exceptions to the rule.

THE *Scientific American* for October 10 contains two papers of interest in connection with the problem of "aviation." M. Émile Guarini describes some experiments by Prof. Bertelli for studying the action of air currents on curved surfaces such as may be taken to represent birds' wings, and a new aëroplane machine, constructed by Messrs. Groombridge and South, is described, which is stated to be 80 feet long and 60 feet wide (the figure of the "full-sized model" hardly corresponds to these dimensions), and is to be supported on two sets of superposed aëroplanes, one at the front and the other at the rear of the machine.

IN his fifth report on seismological investigations presented to the British Association at Bradford, Prof. Milne directed attention to the connection between large earthquakes and variations of latitude indicated by a comparison of the statistics for the period 1895–1898. Mr. Adolfo Cancani has published in the *Bolletino* of the Italian Seismological Society the corresponding figures for 1899–1902, and the results tend to confirm Prof. Milne's hypothesis. The figures for 1895 and 1896 give a smaller number of earthquakes satisfying the conditions laid down by Mr. Cancani than would be required on the hypothesis of such a connection, but this the author attributes to the fact that the arrangements organised by Prof. Milne for recording seismological observations were not completed in the two years in question.

WE have received from the makers—Messrs. Newton and Co., 3 Fleet Street—an extremely simple device called the "Boyla" tube, which has been designed for the purpose of demonstrating all the phenomena attendant upon the processes of ebullition and condensation. It consists of a strong glass tube about four inches long and three-eighths of an inch in diameter, in which a readily vaporisable liquid is hermetically sealed. When held over a very small flame the liquid boils, and when its temperature reaches the critical point the surface rises and becomes ill-defined; then the liquid vaporises and forms clouds in the upper portion of the tube, which in turn condense and form drops that fall through the space above the liquid in the form of rain. Thus the whole process of ebullition and condensation may be shown to a number of students at one time, and in a much more convenient manner than is at present in general use. The tube is bent round at the top in the form of a hook, so that it may be readily suspended over the flame, and, in the absence of accidents, it may be used over and over again *ad libitum*.

THE author of the article on "Botany at the British Association" in NATURE for November 5 writes to say that the last line of the paragraph dealing with Miss Sargant's paper on the origin of the Monocotyledons (p. 18) should read, "it was more like a Dicotyledon than a Monocotyledon." In his report he inadvertently transposed the words Dicotyledon and Monocotyledon.

THE September issue of the *American Naturalist* contains a continuation of Prof. Morse's synopses of North American invertebrates, this section dealing with the parasites of the genus Trichodectes, which infest mammals.

IN the October number of the *Zoologist* Mr. J. L. Bonhote records the existence of a British example of the mouse-coloured bat (*Myotis murinus*), taken at Girton in 1888. The specimen was probably brought over from the Continent with plants or other produce. The only other record of the species in our islands is afforded by some specimens taken in the grounds of the British Museum previous to 1855.

A PAPER in the October issue of the Zoological Society's *Proceedings* on "The Marine Fauna of Zanzibar and British East Africa," by Mr. F. F. Laidlaw, deals with the planarians of the Zanzibar district, in which, out of a total of nine species collected, eight are described as new, four of them being referred to new genera. Apparently no shore-haunting species have hitherto been recorded from the eastern side of Africa, except in the Red Sea and Cape Colony, hence the high percentage of novelties.

UNDER the title of "Cold Spring Harbor Monographs," the Brooklyn Institute has commenced the issue of a series of short animal biographies after the plan of the well-known "L.M.B.C. Memoirs." Of the two issues before us (forming the first and second of the series), the one, by Miss Smallwood, deals with the beach-flea or sand-hopper (*Talorchestia longicornis*), while the second, by Mr. Davenport, is devoted to the local representatives of the insects of the group Collembola, with special reference to the movements of the section included in the family Poduridæ. Both memoirs are illustrated with plates, which are perhaps a little rough in execution.

DR. O. ABEL, in the *Sitzungsberichte* of the Royal Vienna Academy, describes certain isolated molars of anthropoids from the Leithakalk. One of these, for which the name *Griphopithecus suessi* is suggested, indicates a new generic type, while the other is assigned to Dryopithecus, with the title *D. darwini*. It is also pointed out that the name *Arthropodus*, proposed by Dr. Schlosser last year for certain anthropoid remains, is preoccupied, and the name *Neopithecus* is suggested in its place. In the same journal Dr. F. Werner describes the reptilian and amphibian fauna of Asia Minor. Special attention is devoted to the true lizards (Lacerta), which are illustrated in three coloured plates, one form being described as new, under the name of *L. anatolica*.

A RECENT *Bulletin* of the New York State Museum is devoted to an account, by Dr. J. L. Kellogg, of the feeding habits and growth of *Venus mercenaria*, commonly known as the "little-neck clam." In his introductory remarks the author directs attention to the rapid diminution in the number both of that species and of the true "clam" (*Mya arenaria*), both of which form important articles of diet in New York. "Clam-farming" would undoubtedly long ago have taken the place of "clam-digging" were it not that beaches and sand-flats are public property to which everyone has the right of access. The little-neck clam, although it will also flourish between tide-marks, grows most abundantly below low-tide mark, where it is taken with tongs. "Much of the shallow bottom about Long Island, in which clams were formerly taken, has been leased to oystermen. The profit from oyster culture is much greater, acre for acre, than that derived from the taking of hard clams, which are left to propagate by the natural method. The areas left to clammers are now limited, and the great part of the supply used in the canning industry comes from the southern coast. At the same time clams are rapidly diminishing in the available beds."

THE new cone of Mont Pelée and the gorge of the Rivière Blanche, Martinique, are dealt with by Mr. E. O. Hovey (*Amer. Journ. Science,* October). He directs special attention to the new "spine" or obelisk of which an illustration was given in NATURE for October 1. Mr. Hovey remarks that no one can say exactly what the nature of the spine is, but probably it is largely pumiceous. Another striking feature is the filling of the gorge of the Rivière Blanche with calcined rocks, dust, and ashes which have been poured out of the crater by numerous eruptions.

THE National Transcontinental Railway is planned to extend to the north of the Canadian Pacific Railway, from New Brunswick through Quebec and Ontario to Winnipeg, in Manitoba. There it meets the Canadian Pacific Railway, and diverges again to the north, through parts of

Assiniboia, Saskatchewan, Alberta, and Athabasca, and across British Columbia to the neighbourhood of Port Simpson. In aid of this enterprise a concise report on the resources of the line of country between Quebec and Winnipeg has been drawn up by Dr. H. M. Ami, of the Geological Survey of Canada (Sessional Paper, No. 143). The physical geography, geology, soils and economic minerals, and the natural history generally are described.

IN some notes on the geology of the Hawaiian Islands (*Amer. Journ. Science,* October), Mr. J. C. Branner directs attention to the striking series of canyons in the volcanic rocks on the northern coast of Hawaii. There are bluffs with an elevation of a thousand feet, and enormous gorges that extend inland with almost perpendicular walls, some of which are said to be 2000 feet in height. The gorges are nearly or quite as deep near their upper ends as at the lower ends, and they have flat bottoms. They were formed as V-shaped gorges on the land, and have sunk until their lower ends were occupied by the sea, forming deep fjords which were soon filled by material derived partly from the sea and partly from streams. Other interesting features are dealt with by Mr. Branner.

A FULL account of the life and work of the late Prof. Cornu is contained in the *Revue générale des Sciences* for October 30. The appreciation is from the pen of M. C. Raveau.

THE lecture on the periodic system of the elements delivered by Sir William Ramsay at the recent meeting of the German Association at Cassel (see NATURE, October 15, p. 586) has been published in pamphlet form by the firm of J. A. Barth, Leipzig.

AMONG articles dealing with scientific subjects contained in the November reviews and magazines, we notice two dealing with recent experiments on radium. One is by Mr. J. B. Burke on the radio-activity of matter, and is contained in the *Monthly Review,* the other, on the riddle of radium, is by Mr. A. S. M. Hutchinson, and is published in *Pearson's Magazine.* The latter magazine gives considerable prominence to science this month, for in addition to the article mentioned, there is one on "Our Descent from Monkeys," by Mr. S. S. Buckman, illustrated by photographs showing habits and characteristics that link man to monkey forms, and also descriptive accounts of the Waimangu geyser, New Zealand, and the habits of woodcocks.

A PAPER read by Mr. Edmund McClure at the Church Congress held at Bristol last month is a satisfactory indication of the sympathetic attitude which the churches now show towards scientific research. Mr. McClure's paper was entitled "The Aids which Science gives to the Religious Mind," and in it, after referring to Mendeléeff's periodic law and the recent work of Sir W. Crookes and Sir W. Ramsay, he asks:—"Does not the religious mind, which lives and moves in the sphere of the unseen, find an aid in such an extension of the reach of the mental eye?" It is encouraging to know that scientific work and thought can inspire reflections on the relation between the visible and invisible universes.

MESSRS. TOWNSON AND MERCER, of Camomile Street, London, have submitted to us for examination a form of extensimeter designed by the Rev. G. B. Lavelle, of Waterford. The method of measuring linear expansion upon which the construction of the apparatus depends, is already well known in physical laboratories, and the apparatus is an elaborate form of one described in elementary books on practical physics. The instrument consists of a brass cylinder half a metre long, with side tubes for the ingress and egress of steam. The half-metre metal rod of which the linear expansion is to be determined rests on the bottom of the cylinder, and its other end passes through a hole in a movable metal cap to the cylinder. Temperatures are measured by thermometers introduced through india-rubber stoppers in the side tubes, and the spherometer is supported on a brass plate with a hole in the centre, the plate being so supported that it and the spherometer can be moved away from any issuing steam. A dry cell and electric bell are supplied with the apparatus to provide for greater accuracy in determining the instant of contact between the spherometer and the metal rod, but this seems an unnecessary elaboration.

HIGH vacua for distillation under reduced pressure can be rapidly produced by filling the apparatus with carbon dioxide and condensing this with liquid air. Liquid carbon dioxide cannot be used, as it contains 0·75 per cent. by volume of dissolved air, but carbon dioxide snow gave good results; the dissolved air, like that dissolved in water, contains an excess of oxygen, the proportion being 24·1 per cent. by volume. The most convenient method is to prepare the gas from marble and hydrochloric acid, and to exhaust to 30 mm. by means of a water-pump; this operation is repeated four times, and on cooling with liquid air a vacuum of 0·1 mm. is produced. The lowest pressure recorded was 0·026 mm. when rubber connections were used, but in a vessel made wholly of glass the vacuum required for the production of kathode rays could be obtained. Ernst Erdmann, in describing this method in a recent number of the *Berichte,* adds that in London liquid air costs less than fivepence per kilo.

THE additions to the Zoological Society's Gardens during the past week include a Ring-tailed Lemur (*Lemur catta*) from Madagascar, presented by Lady Campbell; a Grey Seal (*Halichoerus grypus*) from the West Coast of Ireland, two Meyer's Parrots (*Poeocephalus meyeri*) from South-east Africa, two Yellow-billed Cardinals (*Paroaria capitata*) from Chili, five Bungoma River Turtle (*Emyda granosa*), three Roofed Tortoises (*Kachuga tectum*), three Indian Eryx (*Eryx johni*), four Conical Eryx (*Eryx conicus*) from India, a Four-lined Snake (*Coluber quatuorlineatus*), South European, deposited; a Polar Bear (*Ursus maritimus*) from Nova Zembla, purchased.

OUR ASTRONOMICAL COLUMN.

REVISION OF ROWLAND'S WAVE-LENGTHS.—In view of the extreme importance to workers in astrophysics of having a perfectly trustworthy system of standard wave-lengths, Prof. Hartmann reviews, in No. 3, vol. xviii., of the *Astrophysical Journal,* the methods used by Rowland in constructing his wave-length tables, and points out their sources of error. He shows that Rowland made the metallic arc wave-lengths given in his "New Table of Standard Wave-lengths" coincide with those of the solar spectrum by applying purely empirical corrections which cannot now be found. In a series of tables Prof. Hartmann also shows that differences, amounting in some cases to 0·03 unit, exist between the solar and metallic wave-lengths, and suggests that further experiments should be performed, on similar lines to those pursued by Michelson and Fabry and Perot, for the purpose of determining a general factor—the F of Fabry and Perot —by which the whole of Rowland's table might be reduced to a rationalised standard from the equation $\lambda=(\text{F and P})\text{F}o$, where (F and P) is the absolute wave-length found by the French observers, and F*o* is the factor mentioned above. This would produce an errorless wave-length on Rowland's scale for each of the thirty-three lines measured by Fabry